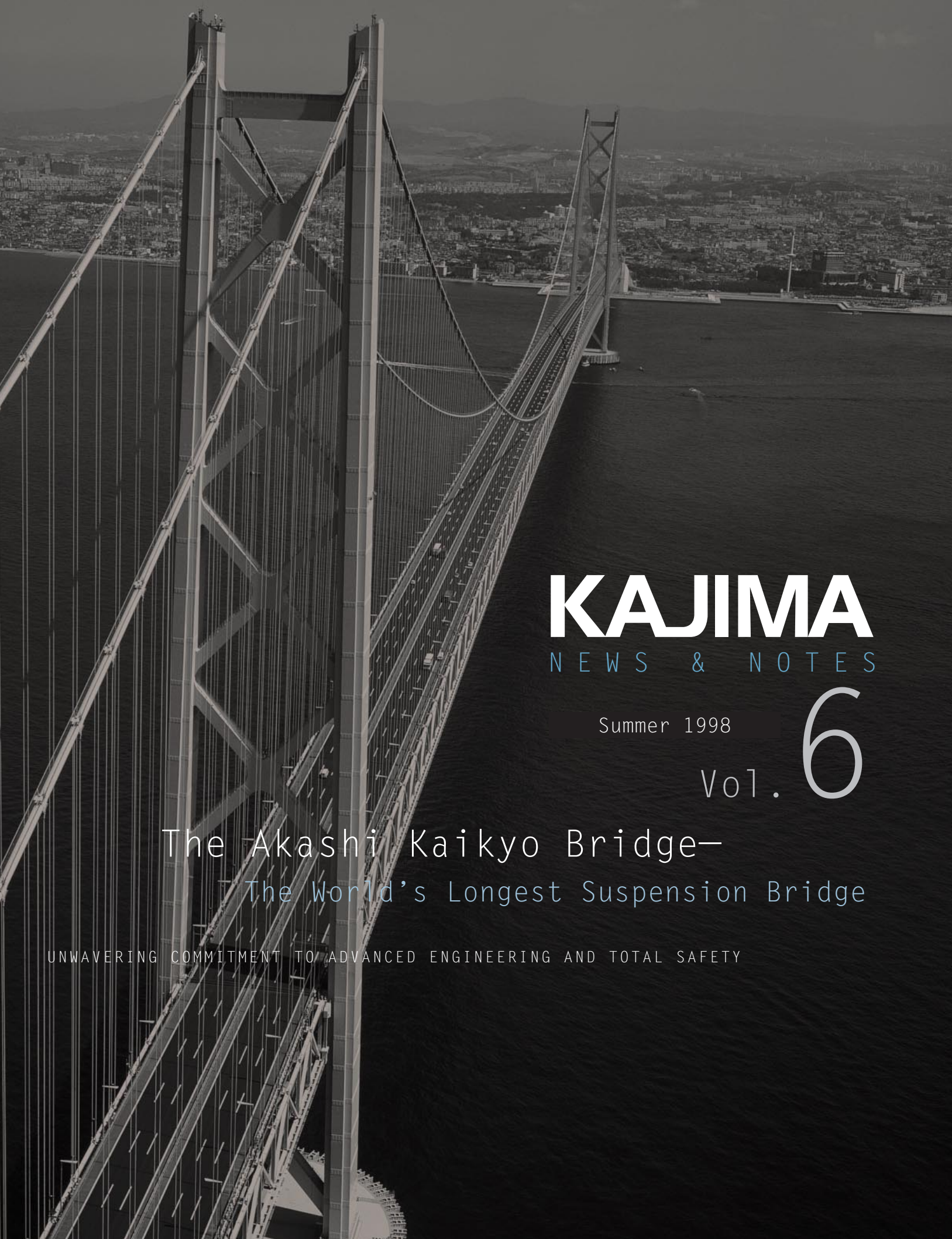


KAJIMA

NEWS & NOTES

Summer 1998

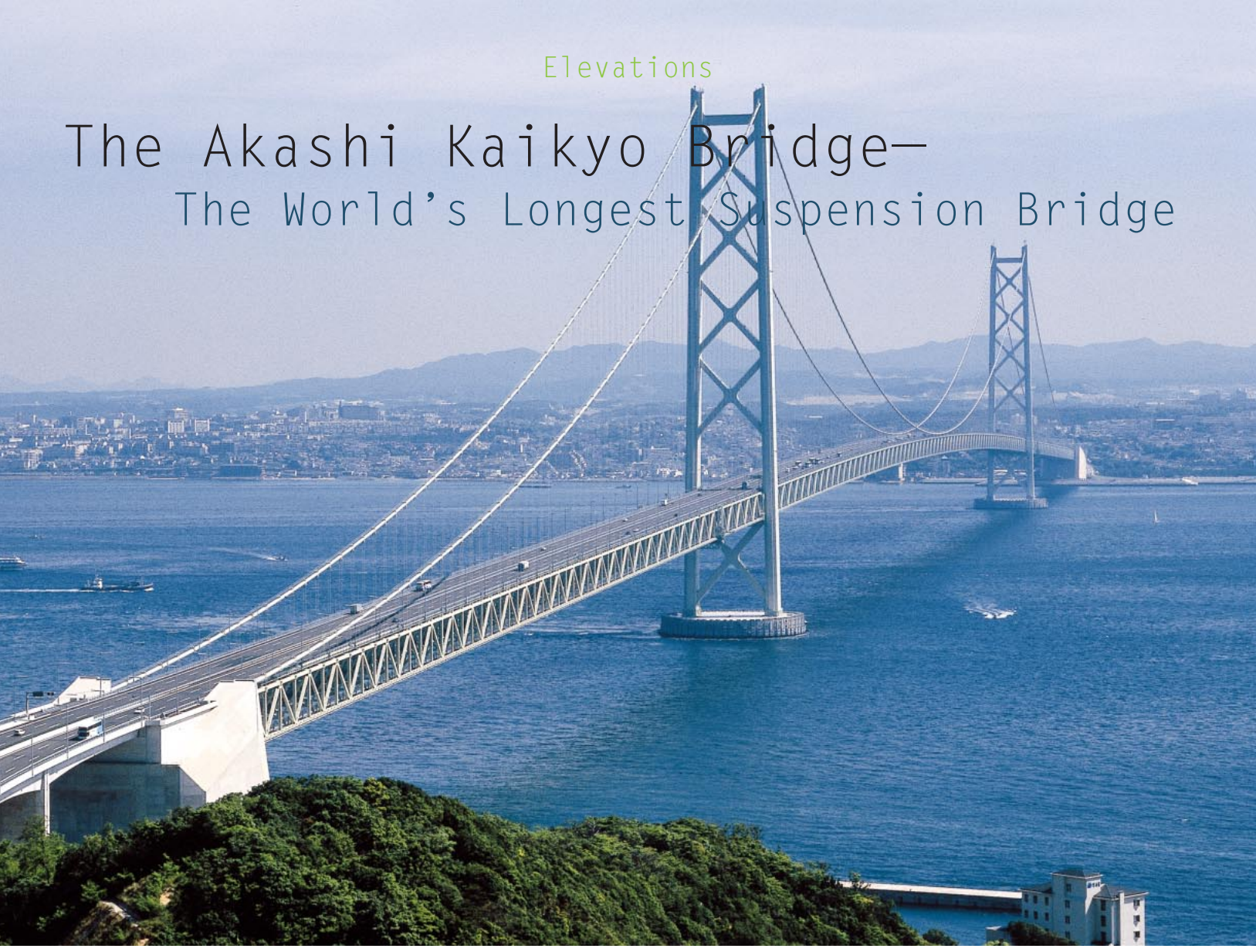
Vol. 6

The Akashi Kaikyo Bridge—

The World's Longest Suspension Bridge

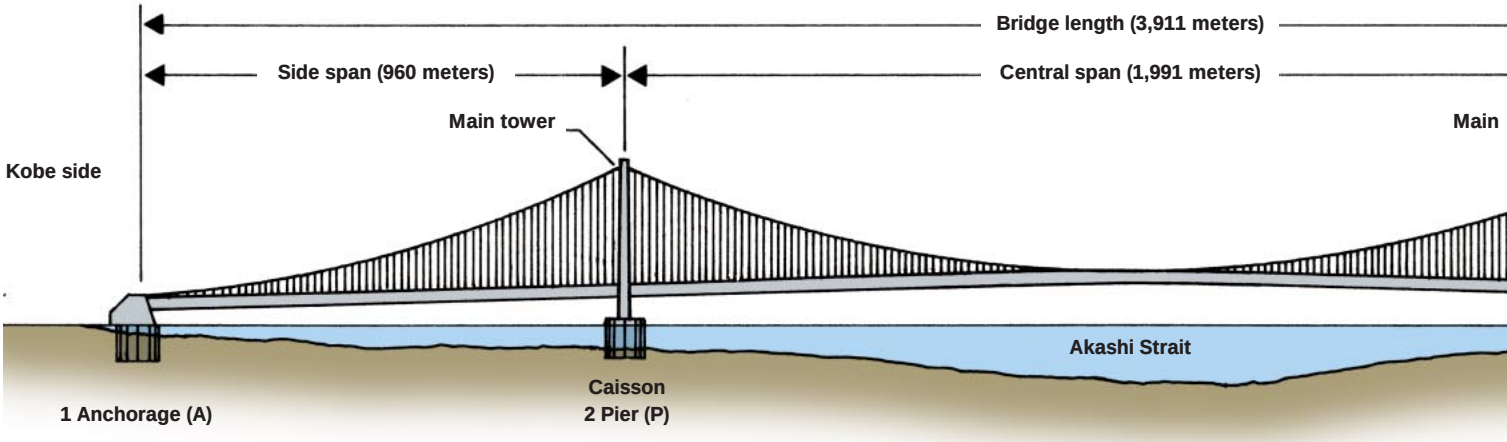
UNWAVERING COMMITMENT TO ADVANCED ENGINEERING AND TOTAL SAFETY

The Akashi Kaikyo Bridge—
The World's Longest Suspension Bridge



View of the Akashi Kaikyo Bridge

Diagram of the Akashi Kaikyo Bridge



A 10-Year Project That Required the Cumulative Efforts of Two Million People to Complete

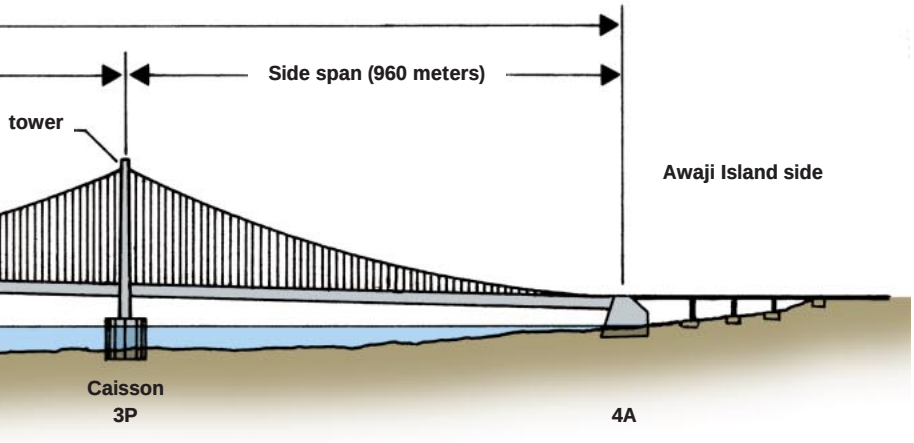
Stretching gracefully across the waters of the Akashi—the strait located at the entrance of Osaka Bay—the 3,911-meter-long Akashi Kaikyo Bridge required more than 10 years and the cumulative efforts of at least two million people to complete. The bridge was built in waters with depths of up to 110 meters to link Kobe, which is on Japan's main island of Honshu, with Awaji Island. Completed in April 1998, the bridge stands as a shining testament to the capabilities of Japanese technology.

Construction of the bridge was complicated by heavy traffic in the strait, which averages approximately 1,400 ships per day. To provide ample room for such a large volume of maritime traffic, a central span—the world's longest, measuring 1,991 meters—was constructed. The side spans of the bridge measure 960 meters each.

Kajima Heads Caisson Installation and Concrete Placement

A Kajima-led joint venture was responsible for the installation and concrete placement of the caisson—a gigantic steel chamber used as the foundation of the main tower on the Kobe side. To provide a flat surface for positioning the caisson in fast-flowing waters, the seabed surface—comprising an area approximately the same size as a baseball field—was excavated about 14 meters to a consolidated gravel layer. Roughly 107,000 cubic meters of soil and rock were removed using large barge-mounted buckets ranging in capacity from 85 to 125 tons.

To install the caisson, a laying-down method was used. Constructed offsite, the cylindrical steel caisson measures 65 meters in height (approximately the same height as a 33-story building) and 80 meters in diameter and weighs 15,000 tons. The sixteen 12-meter-wide exterior compartments had to be slowly flooded to attain proper balance, and the caisson then carefully lowered into place.



Positioning of tower anchor frames

The bridge has been nicknamed the Pearl Bridge because of its majestic appearance.

In March 1989, the caisson was floated, put into position, and sunk in waters 60 meters deep. The positioning of the caisson was monitored by three instruments located above ground as well as by a device attached to the caisson itself. A special wave-blocking method was used in the caisson sinking process. Finally, the caisson was lowered into place on the seabed only 25 millimeters from the location called for in the plans. Graded aggregate and unitized riprap were placed around the caisson to prevent scour from the four-meter-per-second currents.

In the core of the caisson, 270,000 cubic meters of antiwashout underwater concrete was placed. Next, reinforced concrete units comprising 89,000 cubic meters of concrete were put into position. Finally, two 200-ton anchors were positioned.

The Great Hanshin Earthquake Strikes

The biggest scare during construction was the 7.2-magnitude Great Hanshin Earthquake, which devastated nearby Kobe in the early morning hours of January 17, 1995. The bridge is designed to withstand a magnitude 8.5 quake with an epicenter 150 kilometers away; however, the epicenter of the Great Hanshin Earthquake was just four kilometers away. A post-quake survey of the bridge revealed that the central-span distance between the two caissons (2P and 3P) had lengthened 80 centimeters, while the side-span distance between the main tower caisson (3P) and the anchorage on the Awaji Island side (4A) had lengthened 30 centimeters. Although the quake had lengthened the span between the two sides approximately one meter, engineers concluded that the foundations and anchorages themselves had not been damaged—a testament to the project's advanced design and construction techniques.

Uncompromising Commitment to Safety

Another remarkable feature of the Akashi Kaikyo Bridge is that there were no work-related deaths during its 10-year construction. This is something to be just as proud of as the fact that the project culminated in the creation of the world's longest suspension bridge.

World's Longest Suspension Bridges

Rank	Name	Length	Location	Year Completed
1	Akashi Kaikyo Bridge	1,991m	Japan	1998
2	Great Belt Link	1,624m	Denmark	1998
3	Humber	1,410m	United Kingdom	1981
4	Jiangyin Yangtze	1,385m	China	1999 (scheduled)
5	Tsing Ma	1,377m	China (Hong Kong)	1997
10	Minami Bisan-Seto	1,100m	Japan	1988

Kajima around the World

From Japan

President Umeda Assumes Chairmanship of Japan Civil Engineering Contractors' Association

Kajima Corporation President Sadao Umeda assumed the chairmanship of the Japan Civil Engineering Contractors' Association at its General Annual Meeting held on April 24, 1998. Having served as vice-chairman, Umeda succeeded to the post upon the retirement of former chairman Moriji Toda, president of Toda Corp. As Japan's most prominent construction industry organization, the 179-member association can expect to accomplish much under the capable guidance of Chairman Umeda.

Project to Protect the Statue of Liberty in Japan's Odaiba Kaihin Park from Earthquake Damage

To protect the Statue of Liberty, due to be erected in Japan's Odaiba Kaihin Park in January 1999, from damage during earthquakes, Kajima has installed an isolation device in the statue's pedestal. The statue, a replica of the one in New York City, has been transported from its home location along the banks of the River Seine in Paris, France, in conjunction with the start of the upcoming "The Year of France in Japan." The statue measures 17.4 meters in height, including the pedestal, and weighs approximately 90 tons. Because the statue's main structure cannot be reinforced to protect it from damage caused by shaking during earthquakes, Kajima utilized ball bearing load-technology mechanisms and oil dampers in the isolation device installed in the six-piece pedestal. The device will prevent the statue from being damaged during earthquakes of magnitudes up to 7.0 on the Japanese scale.

From the Philippines

Ford Motors Assembly Plant in the Philippines

The groundbreaking ceremony of Ford Motors Philippines Assembly Plant took place on May 30, 1998. Lilia de Lima, director of the Philippines Economic Zone Authority, was among the many distinguished guests attending the ceremony. This event marked the return of Ford to the Philippines, and the new plant is expected to make a significant contribution to the local economy. The 34,580-square-meter assembly plant, located on a 210,000-square-meter property, is expected to be completed in 13 months. Kajima Resources Development Co., the Philippines subsidiary of Kajima, was selected as the construction manager on a design-build basis. Kajima's proven track record in design-build projects, which includes the highly acclaimed Thailand Auto Alliance automobile assembly plant project for a Ford–Mazda joint venture, was one of the key factors in Ford's selection.

From the United States

Aquarium of the Pacific

On June 12, 1998, over 5,000 people celebrated "Builders' Day" for the new Aquarium of the Pacific, in Long Beach, California. Kajima Urban Development sponsored this event to show appreciation to all the workers who contributed to this project. Marvin Suomi, president and CEO of Kajima Urban Development, participated in the dedication of a plaque recognizing the project's 1,100 workers.

Kajima Urban Development served as program manager and completion guarantor of the 30-month project. The company's participation involved the establishment of a nonprofit organization to finance and operate the facility, the overseeing of design and predevelopment, and construction management. The aquarium opened on schedule on June 20, 1998, with total costs under budget.

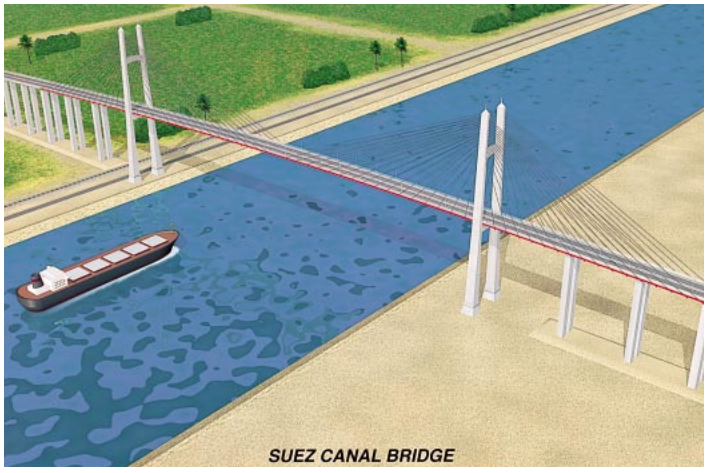
The aquarium was designed by a joint venture between Hellmuth, Obata & Kassabaum, Inc. (HOK), and Esherick Homsey Dodge and Davis (EHDD). Specializing in aquarium projects, EHDD has been involved in the construction of aquariums in such places as San Francisco (Monterey Bay) and Florida.

The aquarium is designed to educate visitors on the wonders of the Pacific Ocean. Exhibit areas consist of open-topped tanks and winding glass passageways that give the visitor the feeling of being submerged in the ocean. Visitors can view sea creatures from three different regions of the Pacific Ocean: coastal California and the Baja Peninsula, the northern waters of the Sea of Okhotsk, and the tropical waters of the South Pacific. An 8,000-pound life-sized fiberglass model of a blue whale hangs in the entrance of the aquarium.

With its unique wave-like architecture and location in the Queensway Bay redevelopment district, the aquarium will serve as part of the rebirth of Long Beach as a major southern California tourist destination.

From Egypt

Order Received for Construction of Suez Canal Bridge Project



Kajima, NKK Corporation, and Nippon Steel Corporation jointly received an order for the construction of the Suez Canal Bridge Project from the the Ministry of Transport and the Ministry of Trade & Supply of the Arab Republic of Egypt. The project involves the construction of a bridge spanning the Suez Canal and related roadways. The bridge will have a total span of 3,900 meters, and Kajima will be responsible for the construction of the bridge's main beam section (total length 730 meters, with a central span of 404 meters) and substructure. The main towers will be 156 meters in height and designed to resemble twin obelisks, in homage to this ancient country's rich history. Designed by Pacific Consultants International, the bridge is scheduled for completion in spring 2001.

KAJIMA CORPORATION

KAJIMA CORPORATION
Head Office
2-7, Motoakasaka 1-chome,
Minato-ku, Tokyo 107-8388, Japan
Telephone: 81-3-3404-3311
Facsimile: 81-3-3470-1444/5

KAJIMA CORPORATION
International Division
28th Floor, Shinjuku Park Tower Building,
7-1, Nishishinjuku 3-chome,
Shinjuku-ku, Tokyo 163-1028, Japan
Telephone: 81-3-5324-5810
Facsimile: 81-3-5324-5815

KAJIMA U.S.A. INC.
26th Floor, 320 Park Avenue,
New York, NY 10022-6815, U.S.A.
Telephone: 1-212-355-4571
Facsimile: 1-212-355-4576

KAJIMA EUROPE B.V.
London
Grove House, 248 A, Marylebone Road,
London NW1 6JZ, U.K.
Telephone: 44-171-465-0007
Facsimile: 44-171-465-8788

KAJIMA OVERSEAS ASIA PTE. LTD.
80, Marine Parade Road,
#14-01/03 Parkway Parade,
Singapore 449269, Singapore
Telephone: 65-344-0066
Facsimile: 65-344-3777

URL: http://www.kajima.co.jp

Printed in Japan